WHAT IS CLAIMED IS:

1. A system for accepting a set of n input signals for presentation to x speakers, where x is any number, said system comprising:

means for expanding in pairs certain of the signals for presentation to the x speakers;

means for expanding in pairs others of the input signals for presentation to the x speakers; and

means when x is less than n for summing the expanded signal pairs for presentation to said x speakers.

2. The invention set forth in claim 1, wherein one of said n input signals is a center speaker sound signal, and wherein said system further includes:

means when x is less than n for summing said center speaker signal with one of said expanded pairs of input signals prior to said presentation to said x speakers.

3. The invention set forth in claim 2 further comprising means for attenuating said center sound signal prior to said summing of said center speaker signal.

4. The invention set forth in claim 3, wherein said attenuating is in the range of 0dB to 6dB.

Sub A1

5. The invention set forth in claim 1, wherein at least one of said expanding means includes a QX filter.

6. The invention set forth in claim 1, wherein at least one of said expanding means includes an OMNI$_2$3D filter.

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7. The invention set forth in claim 1, wherein at least one of said expanding means includes a pair of Q1 filters.

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8. The invention set forth in claim 1, wherein n is 5 and x is 3.

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9. The invention set forth in claim 1, wherein the first pair of input signals are for presentation to the front left and right speakers and wherein the other of said input pairs are for presentation to left and right rear speakers which are not physically present.

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10. The invention set forth in claim 9, wherein the rear pair of input signals are either monaural or stereo.

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11. The invention set forth in claim 10, wherein said other signal expansion means includes a pair of Q1 filters.

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12. The invention set forth in claim 10, wherein said other signal expansion means includes an OMNI$_2$3D filter.

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13. The invention set forth in claim 9, wherein the rear pair of input signals are monaural.

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14. The invention set forth in claim 13, wherein said other signal expansion means includes an OMNI$_2$3D circuit.

15. The invention set forth in claim 13, wherein said other signal expansion means includes a 1$_2$3D circuit.

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16. The invention as set forth in claim 1, wherein at least one of said expanding means includes a QX dual filter.

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17. The invention as set forth in claim 16, wherein said QX dual filter includes means for attenuating the signals input to said QX dual filter in the range of -20dB to -80dB.

18. A method for accepting a set of n input signals for presentation to x speakers, where x is any number, said method comprising the steps of:

expanding in pairs certain of the signals for presentation to the x speakers;

expanding in pairs others of the input signals for presentation to the x speakers; and

summing the expanded signal pairs when x is less than n for presentation to said x speakers.

19. The method set forth in claim 18, wherein one of said n input signals is a center speaker sound signal, and wherein said system further includes the step of:

summing said center speaker signal with at least one of one of said expanded pairs of input signals when x is less than n prior to said presentation to said x speakers.

20. The method set forth in claim 19, further comprising the step of:

attenuating said center sound signal prior to said summing of said center speaker signal.

21. The method set forth in claim 20, wherein said attenuation is in the range of 0dB to 6dB.

22. The method set forth in claim 19, further comprising the step of:

directly passing said center sound signal to a speaker when x equals at least 3.

23. The method set forth in claim 18, wherein at least one of said expanding steps includes passing the sound signal through at least one QX filter.

24. The method set forth in claim 18, wherein at least one of said expanding steps includes the step of passing said sound signal through at least one OMNI$_2$3D filter.

25. The method set forth in claim 18, wherein at least one of said expanding steps includes the step of passing said sound signal through a pair of Q1 filters.

26. The method set forth in claim 18, wherein n is 5 and x is 3.

27. The method set forth in claim 18, wherein the first pair of input signals are for presentation to front left and right speakers and wherein the other of said input pairs are for presentation to rear left and right speakers which are not physically available.

28. The method set forth in claim 27, wherein the rear pair of input signals can be either monaural or stereo.

Sub a3

29. A circuit for converting four input sound signals which are for presentation to four speakers, to two sound signals which are for presentation to two of the four speakers, wherein the four speakers are left front, right front, left rear and right rear, and wherein the two speakers are the left front and the right front speakers, the circuit comprising:

means for passing the front left and right input signals through a QX filter to form a front output pair of signals having a left and right component;

means for passing the rear input signals through a mono to stereo filter to form a rear output pair of signals having a left and right component; and

means for individually summing the left and right components of said front output pair of signals with the left and right components of said rear output pair of signals to form a single pair of left and right signals for presentation to said left front and right front speakers.

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30. The circuit set forth in claim 29, wherein said input sound signals further include a center sound signal for presentation to a center front speaker and wherein said circuit further includes:

means operable when said center front speaker is not present for attenuating said center input sound signal; and

means for presenting said attenuated signal to said individually summed front output pair of signals.

31. The circuit set forth in claim 30, further including means operable when said center front speaker is present for presenting said center input signal to said front center speaker without modification.

32. The circuit set forth in claim 29, wherein the input sound signals for presentation to the rear left and right speakers can be monaural or stereo signals.

26 33. The circuit set forth in claim 25 30, wherein said attenuating means operates within the range of 0dB to 6dB.

34. A method for converting four input sound signals which are for presentation to four speakers, to two sound signals which are for presentation to two of the four speakers, wherein the four speakers are left front, right front, left rear and right rear, and wherein the two speakers are the left front and the right front speakers, comprising the steps of:

passing the front left and right input signals through a QX filter to form a front output pair of signals having a left and right component;

passing the rear input signals through a mono to stereo filter to form a rear output pair of signals having a left and right component; and

individually summing the left and right components of said front output pair of signals with the left and right components of said rear output pair of signals to form a single pair of left and right signals for presentation to said left front and right front speakers.

35. The method set forth in claim 34, wherein said input sound signals further include a center sound signal for presentation to a center front speaker and wherein said method further includes the steps of:

attenuating said center input sound signal when said center front speaker is not present; and

presenting said attenuated signal to said individually summed front output pair of signals.

36. The method set forth in claim 35, wherein the input sound signals for presentation to the rear left and right speakers can be monaural or stereo signals.

37. The method set forth in claim 36, wherein when said rear input sound signals are monaural and wherein said method further includes the steps of:

converting said sound signals from monaural to stereo sound signals.

38. The method as set forth in claim 37, wherein said converting step includes the step of:

separating said monaural signal into two equal information content input signals having a phase relationship of approximately 60° with one of the input signals attenuated from the other; and

applying each of these signals to respective inputs of a sound expansion sound circuit.

39. The method as set forth in claim 38, wherein the phase relationship is a phase delay and wherein the signal with the leading phase is the input signal that is attenuated.

40. The method as set forth in claim 38, wherein said attenuation is sufficient to provide an equal average loudness to a listener of sound from said transducers.

41. The method as set forth in claim 40, wherein said attenuation is sufficient to provide a sound image that is centered for a listener of sound.

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~~42.~~ The method as set forth in claim ~~40~~, wherein said attenuation is in the range of 0dB to 6dB.

43. The method as set forth in claim 38, ~~wherein~~ said phase ~~relationship~~ is applied over at ~~least the~~ range 100 Hz $\leq$ f $\leq$ 10 Khz, where f is frequency.

44. The method as set forth in claim 35, further comprising the step of:

presenting a center input signal to a front center speaker without modification when said front center speaker is available.

45. A system for accepting a set of four input signals for presentation to two speakers, wherein a first pair of signals are for presentation to front left and right speakers and wherein a second pair of signals are for presentation to rear left and right speakers, said system comprising:

means for passing the first pair of the input signals through a QX filter;

means for passing the second pair of the input signals through a monaural to stereo expansion circuit; and

means for summing the output signal pairs from said QX filter with the output signal pairs of said expansion circuit for presentation to left and right front speakers.

46. The invention set forth in claim 45, wherein an additional one of said input signals is a center speaker sound signal, and wherein said system further includes:

means for summing said center speaker signal with said summed output signals prior to said presentation to said front left and right speakers.

47. The invention set forth in claim 46, further comprising means for attenuating said center sound signal prior to said summing of said center speaker signal.

48. The invention set forth in claim 47, wherein said attenuating is in the range of 0dB to 6dB.

49. The invention set forth in claim 45, wherein said monaural to stereo expansion circuit includes:

means for separating said input signals into two equal signals having a phase relationship of approximately 60° with one of the input signals attenuated from the other.

50. The invention set forth in claim 49, wherein said attenuation is in the range of 0dB to 6dB.

51. The invention set forth in claim 49, wherein said phase relationship is applied over at least the range of 100 Hz $\leq$ f $\leq$ 10 Khz, where f is frequency.

52. The invention set forth in claim 49, wherein said sound expansion circuit is a QX circuit.

53. The invention set forth in claim 49, wherein said sound expansion circuit is a pair of Q1 circuits.

54. The invention set forth in claim 49, wherein said separating means includes:

means for independently modifying the phase of each of said equal input signals over the entire frequency spectrum while maintaining said 60° phase relationship at all frequencies.

55. A circuit for converting first input signals which contain sound signals for driving at least four sound producing transducers to second sound signals which drive three or less sound producing transducers, the circuit comprising:

means for sound expanding a first left and right pair of said first sound signals;

means for passing a second left and right pair of said first sound signals through a stereo producing circuit; and

means for summing the output of said stereo producing circuit with the output of said sound expanding means for presentation to said three or less sound producing transducers.

56. The circuit set forth in claim 55, wherein said stereo producing circuit means includes:

means for accepting two input signals;

means for delaying a first one of said input signals with respect to the second one of said input signals;

means for attenuating said second input signal with respect to said first input signal;

means for creating from the delayed first input signal and from the attenuated second input two independent crossover signals having frequencies only above approximately 110 Hz;

means for passing each of said crossover signals through respective Q1 filters to create an output signal;

means for summing the output of the Q1 filter which is associated with the attenuated second input signal with the delayed first input signal to create a first output signal; and

means for summing the output of the Q1 filter which is associated with the delayed first input signal with the attenuated second input to create a second output signal, said first and second outputs operable for driving spaced apart transducers to create an expanded stereo sound image signal of the input sound signal.

57. The circuit set forth in claim 56, further including:

means for splitting a monaural input signal to two equal input signals for presenting to said accepting means.

58. The circuit set forth in claim 56, wherein said Q1 filter passing means includes:

means for inverting the input signal; and

means for phase and amplitude adjusting the inverted signal.

59. The circuit set forth in claim 58, wherein said phase and amplitude adjusting means includes:

means for adjusting the phase and amplitude on a frequency dependent basis.

60. The circuit set forth in claim 55, further including:

means for accepting a sound input for driving a center speaker; and

means, including attenuation means, for summing said accepted center sound signal with said summed other sound signals.

61. The circuit set forth in claim 60, wherein said attenuation is in the range of 0dB to 6dB.

62. A method for converting first sound signals which contain sound signals for driving at least four sound producing transducers to second sound signals which drive three or less sound producing transducers, the method comprising:

sound expanding a first left and right pair of said first sound signals;

passing a second left and right pair of said first sound signals through the steps of a stereo producing method; and

summing the output of said stereo producing method with the expanded output of said sound expanding step for presentation to said three or less sound producing transducers.

63. The method set forth in claim 62, wherein said stereo producing output comprises the steps of:

accepting two input signals;

delaying a first one of said input signals with respect to the second one of said input signals;

attenuating said second input signal with respect to said first input signal;

creating from the delayed first input signal and from the attenuated second input two independent crossover signals having frequencies only above approximately 110Hz;

passing each of said crossover signals through respective Q1 filters to create an output signal;

summing the output of the Q1 filter which is associated with the attenuated second input signal with the delayed first input signal to create a first output signal; and

summing the output of the Q1 filter which is associated with the delayed first input signal with the attenuated second input to create a second output signal, said first and second outputs operable for driving spaced apart transducers to create a stereo sound image signal of the input sound signal.

64. The method set forth in claim 63, further comprising the step of:

splitting a monaural input signal to two equal input signals for presenting to said input signal accepting step.

65. The method set forth in claim 63, wherein said Q1 filter passing includes the step of:

inverting the input signal;

phase adjusting the inverted signal; and

amplitude adjusting the phase adjusted signal.

66. The method set forth in claim 65, wherein said phase adjusting step includes the step of adjusting the phase on a frequency dependent basis; and wherein said amplitude adjusting step includes the step of adjusting the amplitude on a frequency dependent basis.

67. The method set forth in claim 62, further comprising the steps of:

accepting a sound input for driving a center speaker;

attenuating said accepted center sound signal; and

summing said accepted center sound signal with said summed other sound signals.

68. The method set forth in claim 67, wherein the attenuation in said attenuating step is in the range of 0dB to 6dB.

S2

69. A method for creating a stereo surround sound image for a listener positioned with respect to first and second sound transducers from a plurality of sound inputs which are directed to at least four transducers, where the sound inputs for the two speakers which have been eliminated are monaural, said method comprising the steps of:

accepting said sound inputs on two inputs;

attenuating one of said monaural inputs;

delaying the other one of said monaural inputs;

modifying each of said attenuated and delayed input signals by removing therefrom all frequencies below a cutoff frequency;

providing said modified signals to the respective inputs of Q1 filters;

summing the output of the attenuated signal Q1 filter with the delayed first input signal to provide a first output signal for presentation to the sound transducer; and

summing the output of the delayed signal Q1 filter with the attenuated input signal to provide a second output signal for presentation to the second sound transducer.

S3 S2

70. The method set forth in claim 69, wherein said cutoff frequency is 110Hz.

S4 S3

71. The method set forth in claim 70, wherein said Q1 filters invert, phase adjust and amplitude adjust the presented signals.

S5 S4

72. The method set forth in claim 71, wherein said phase adjustment is different for different frequencies.

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